

Remarks

Claims 1-31 and 33-36 are pending in the application. Claim 32 has been canceled. Claims 1, 8, 25, 26, 28, and 31 have been amended. New claim 36 has been added. No new matter has been added by virtue of this amendment. Reconsideration of the application in view of this response is requested.

Information Disclosure Statement

An information disclosure statement on form PTO-892 will be submitted shortly.

Drawings

The examiner objects to the drawings under 37 CFR 1.83(a), stating that the drawings must show every feature of the invention specified in the claims. The Examiner provides three such issues.

The Examiner states that the core having a first and second portion of different diameters, as recited in claim 8 must be shown. Regarding claim 8, applicant would respectfully ask the Examiner to consider that the core having a first and second portion of different diameters is shown as item 42 in FIGS. 1a, 1b, as item 42' in FIGS. 2a, 2b, and as item 68 in FIGS. 3a, and 3b. Items 42, 42', and 68 move with the core and have different diameters than remaining portions of the core.

The Examiner states that the second bearing including the coil as recited in claim 31 must be shown. Regarding claim 31, applicant would respectfully ask the Examiner to consider that claim 31 has been amended to provide that "said second bearing is connected to said coil," as shown as item 66 in FIGS. 3a, 3b.

The Examiner states that a sleeve within said coil as recited in claim 32 must be shown. Applicant has canceled claim 32.

Thus, the objection to the drawings has been traversed.

Specification

The specification has been amended as requested by the Examiner.

Claim Objections

The problems with claims 8, 10, 25, and 26 identified by the Examiner have been fixed.

Claim Rejections— 35 U.S.C. § 102(b)

The Examiner rejects claims 28, 30-32, and 34 under 35 U.S.C. § 102(b), as being anticipated by Roeger. Claim 1 states:

28. A device for providing displacement information, comprising a housing, an inner surface within said housing, said inner surface having an inner-surface-inside dimension, said housing for holding a displacement sensor and a guidance mechanism, said displacement sensor including a coil and a captive core, said captive core having a core-outside dimension, wherein said guidance mechanism comprises a first bearing and a second bearing for guiding said core, wherein said first bearing is connected to said housing, wherein said first bearing has an axial hole having an axial-hole dimension about equal to said core-outside dimension, wherein said core slidably extends through said axial hole, wherein said second bearing has a second-bearing-outside dimension about equal to said inner-surface-inside dimension, wherein said guidance mechanism is for resisting lateral movement of said core while allowing axial movement of said core into and out of said coil, wherein said inner-surface-inside dimension is greater than inside diameter of said coil, wherein said captive core has a stroke length, wherein said captive core has a first length of contact with said first bearing, wherein said captive core has a second length of contact with said second bearing, wherein said first length of contact is less than said stroke length and wherein said second length of contact is less than said stroke length.

The Examiner states that “said guidance mechanism comprises a first bearing and a second bearing for guiding said core (See FIG. 1, items 34 and 38, also note item 20 where it contacts the magnetic core 46 is interpreted as a bearing).”

Applicant would respectfully ask the Examiner to consider that Roeger does not teach or suggest that “wherein said captive core has a stroke length, wherein said captive core has a first length of contact with said first bearing, wherein said captive core has a second length of contact with said second bearing, wherein said first length of contact is less than said stroke length and wherein said second length of contact is less than said stroke length.” However, item 38, of Roeger has a length of contact with non-magnetic end portion 48 and with non magnetic end portion 50 that is far greater than stroke length of Roeger’s tip member 64. Also item 20 has a length of contact with central magnetic portion 46 that appears to be greater than stroke length of Roeger’s tip member 64. Thus,

Roeger does not teach or suggest the limit of claim 28, as amended. Therefore, the rejection of claims 28, 30-32, and 34 under 35 U.S.C. § 102(b) as being anticipated by Roeger has been traversed.

The Examiner rejects claims 28 and 29 under 35 U.S.C. § 102(b), as being anticipated by Inaba et al. However, applicant would respectfully ask the Examiner to consider that Inaba does not teach or suggest that "said inner-surface-inside dimension is greater than inside diameter of said coil," as provided in claim 28, as amended. Inaba has an inner surface contacting bearings 56 and 57 but the inner-surface-inside dimension is equal to the inside diameter of said coil. If Inaba decreased the inside diameter of his coil so it is less than his inner-surface-inside dimension his invention would stop working for its intended purpose which is to allow bearing 57 to pass through the coil so ferromagnetic body cores 21 and 22 could both go through the coil. Thus, Inaba does not teach or suggest the limit of claim 28, as amended. Therefore, the rejection of claims 28 and 29 under 35 U.S.C. § 102(b) as being anticipated by Inaba et al. has been traversed.

Claim Rejections-- 35 U.S.C. § 103

The Examiner rejects claims 1-10, 15, 18-21, 23, and 25-27 under 35 U.S.C. § 103(a), as being unpatentable over Roeger.

Claim 1 states:

1. A device, comprising a housing holding a sensor, said sensor including a coil and a captive core, wherein an electrical measurement of said coil provides information about at least one from the group including displacement of said captive core and velocity of said captive core, further wherein said coil has an axis extending in a first direction, wherein said housing has a minimum outside dimension that is less than 3.00 mm when measured perpendicular to said first direction, wherein said housing further comprises a support for said captive core, wherein resistance to lateral force provided by said support is independent of displacement of said core.

Applicant would respectfully ask the Examiner to consider that Roeger does not teach or suggest "a support for said captive core, wherein resistance to lateral force provided by said support is independent of displacement of said core." Roeger states that "springs 52 and 58 permit the armature 44 to be moved axially but restrain the armature from radial movement" (column 2, lines 20-21). Thus, resistance to lateral force is provided by springs 52 and 58. Roeger also states that "a nonmagnetic flat spring 52 is peripherally clamped between an annular member 34 and a nonmagnetic plug 54 which is secured in main body 12." As described a central portion of flat springs 52 and 58 move with tip 64. The maximum resistance to lateral force is provided when central portion of

flat springs 52 and 58 is in line with the other portions of flat springs 52 and 58. As they move in either direction springs 52 and 58 extend out to provide a cone shape, and the extended springs provide less resistance to lateral force. The farther from the in-line position, the less resistance to lateral force. Thus, Roeger does not teach or suggest the limit of claim 1, as amended.

As to the size dimension of claims 1-6, applicant would respectfully ask the Examiner to consider that Roeger has a complex device chock full of parts. Further invention would be required to miniaturize the design of Roeger with all his parts while still providing the functionality and qualities described by Roeger.

Therefore, the rejection of claims 1-10, 15, 18-21, 23, and 25-27 under 35 U.S.C. § 103(a), as being unpatentable over Roeger has been traversed.

The Examiner rejects claims 1-7 under 35 U.S.C. § 103(a), as being unpatentable over Hiramatsu et al. However, applicant would respectfully ask the Examiner to consider that Hiramatsu also has a complex device chock full of parts. With this number of parts a bigger is clearly more robust. A straightforward reduction in size of each part, to meet the size limitation of claims 1-7 is expected to create serious functionality problems. For example, if the dimensions of the ball bearings are reduced by the factor of three required to shrink Hiramatsu to the dimensions of claim 1, the ability of the ball bearings to roll and reduce friction is likely to degrade. Furthermore, the ability to resist lateral forces is likely to degrade with the many substantially smaller parts such a reduction in size would require. Further invention would be required to redesign Hiramatsu, to miniaturize all of his parts, while still providing the functionality and qualities described by Hiramatsu.

Alternatively, further invention would be required, as provided by the present inventors, to eliminate most of the parts, and to provide a design with so few parts that miniaturization was possible without having to provide any one part with dimensions so small as to sacrifice the robustness of the device and make the whole device unworkable. By eliminating most of the parts the present inventors were able to reduce the dimensions of the housing to those provided in claims 1-6.

Because the robustness of the Hiramatsu design is degraded by the miniaturization to 1/3 the size Hiramatsu provided it would not be obvious to provide the dimensions of claims 1-7. Therefore, the rejection of claims 1-7 under 35 U.S.C. § 103(a), as being unpatentable over Hiramatsu has been traversed.

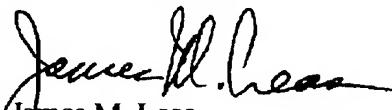
The Examiner rejects claims 8 and 11 under 35 U.S.C. § 103(a), as being unpatentable over Hiramatsu et al. as applied to claim 1 above, and further in view of Chass. The Examiner also rejects claim 12 under 35 U.S.C. § 103(a), as being unpatentable over Hiramatsu et al. in view of Chass and further in view of Jones et al. The Examiner also rejects claim 12 under 35 U.S.C. § 103(a), as being unpatentable over

Hiramatsu et al. in view of Chass and further in view of Arms et al. However, applicant would respectfully ask the Examiner to consider that neither Hiramatsu, Chass, Jones, or Arms teaches or suggests a way to miniaturize to meet the requirements of claim 1, as amended, that does not require further invention. Thus, the rejection of the dependent claims under 35 U.S.C. § 103(a), has been traversed.

It is believed that the claims are in condition for allowance. Therefore, applicant respectfully requests favorable reconsideration. If there are any questions please call applicant's attorney at 802 864-1575.

Respectfully submitted,

For: David L. Churchill



By: James M. Leas
Registration Number 34,372
Tel: (802) 864-1575

James M. Leas
37 Butler Drive
S. Burlington, Vermont 05403

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Page 12 of 12

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